

Advanced Wireless Communications: Are We Ready?

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With a focus on RF
microelectronics
technologies for
commercial avionics
applications

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What are the applications that will be important 5,10 and 15 years from now?

● EMERGING COMMERCIAL AVIONICS APPLICATIONS

- mm-Wave Gate links to provide un-tethered communication between airplanes and the terminal gate.
 - Upload/Download flight information
 - Download Equipment status information
 - Upload passenger entertainment data (movies, music, etc.)
- Wireless cabin links.
 - Passenger phones
 - Passenger computer links
 - Passenger entertainment
- International DBS access.

What are the technologies that will be important 5,10 and 15 years from now?

MICROELECTRONICS TECHNOLOGY AREAS	TECHNOLOGIES COMMONLY FOUND IN HIGH-VOLUME COMMERCIAL PRODUCTS TODAY	TECHNOLOGIES NOT COMMONLY FOUND IN HIGH-VOLUME COMMERCIAL PRODUCTS TODAY
SEMICONDUCTORS	Si, GaAs, GaAs based heterostructures	Si:Ge, InP based heterostructures, SiC, GaN, Ge
TRANSISTORS	MOSFET, BJT, MESFET, HEMT, HBT	SiT, Planar Doped Barrier Transistors, Permeable Base Transistors
PASSIVES	SAW, Ceramic blocks, stripline, wire inductors, chip capacitors, . . .	MEMS, Thin film resonators
ANTENNAS	Simple wire & wire wound patch, . . .	Directional antennas, phased arrays, . . .

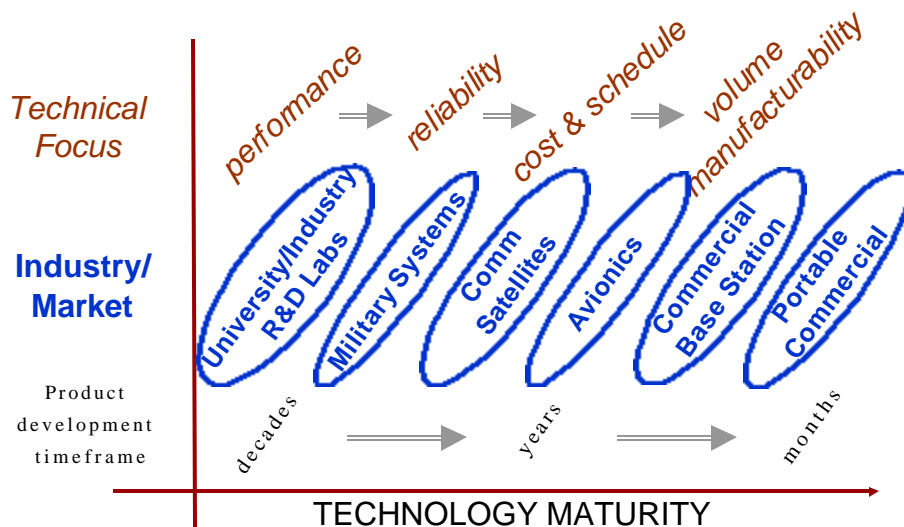
All of the technologies listed in this column were available (at some cost) 15 years ago -- and some have been available for over 30 years.

Available for less than 15 years.
Available for at least 15 years.

Can conventional wireless communications technologies meet the emerging requirements?

- Will need more advancement in the areas of:
 - Microwave and mm-Wave transmitter technology
 - Microwave and mm-Wave packaging and manufacturing
 - Steerable, multi-use antennas
 - Radio architectures to provide non-interfering transmission within cabin
 - New components to meet the requirements of the new radio architectures

What will industry do on its own?



Is there a role for NIST?

- **OF COURSE**

- Time frame for R&D payoff needs to be compatible with product development horizon of the industry.
- The cost and risk of the development efforts need to be compatible with the emphasis on cost for the industry.
- Target commercial development efforts that have a product development cycle and cost-for-performance objective consistent with bringing emerging technologies from research to production.
 - Satellite Communications
 - Avionics
 - Base Station

What will it take to deliver >300 Mbps to a portable appliance?

- Fast devices and broad bandwidth.

What will it take to do it inexpensively in high volume?

Depending on the radio architecture, we will need:

- Advances in packaging and manufacturing techniques for high frequency hardware.
- Advances in integrated component technologies: A/D converters, precision frequency synthesizers.
- Continued advances in low voltage/low power microwave electronics.